QUALITY ASSURANCE PROJECT PLAN FOR
RAINIER COMMONS HOUSE DUST SAMPLE COLLECTION
AND ASSESSMENT

Prepared by:

USEPA Region 10
1200 6th Avenue Suite 900, Seattle, WA 98101
November, 2014

Approval:

_____ **Date:** _____
Kelly McFadden, Program Manager
USEPA R10 – Office of Compliance and Enforcement

_____ **Date:** _____
Michelle Mullin, PCB Coordinator / Project Manager
USEPA R10 – Office of Compliance and Enforcement

_____ **Date:** _____
Ginna Grepo-Grove, Region 10 QA Manager
USEPA R10 - Office of Environmental Assessment

Project Management Elements

1.1 Distribution List

Table 3~~1~~: Distribution List

Copies of the approved/signed QA Project Plan and/or final lab data shall be distributed electronically to the following identified project personnel.

Name	Title/Role	Phone Number	Mail Stop	E-Mail	QAPP	Lab Data
Michelle Mullin	EPA Project Manager / PCB Coordinator	(206) 553-1616	OCE-084	Mullin.michelle@epa.gov	X	X
Jeffry Rodin	START Task Monitor / EPA OSC	(206) 553-6709	ECL-116	Rodin.Jeffry@epa.gov	X	
Michael Worden	START Project Manager, Contact with EPA; Scribe Project Manager	(206) 419-3419 (cell)	NA	MWorden@ene.com	X	
Renee Nordeen	START Sampling Coordinator / Data Management	(206) 624-9537	NA	RNordeen@ene.com	X	X
Lon Kissinger	EPA HH Risk Assessor	(206) 553-2115	OEA-095	Kissinger.Lon@epa.gov	X	X
Jennifer Crawford	EPA QA Chemist; RSCC	(206) 553-6261	OEA-095	crawford.jennifer@epa.gov	X	
Gina Grepo-Grove	Region 10 QA Manager	(206) 553-1632	OEA-096	Grepo-Grove.Gina@epa.gov	X	

1.2 Project Management/Task Organization

Michelle Mullin, EPA PCB Coordinator and Project Manager (PM), has the overall responsibility for management of the project. PM will coordinate sample collection, providing planning background information in addition to coordinating the final assessment of the data. The PM will also be working with the property owners and operators. The project manager provides oversight for study design, site selection, and adherence to design objectives as well as reviewing and approving the project work plan, QAPP, and other materials developed to support the project.

Jennifer Crawford will be the Regional QA Manager's delegated QA chemist and RSCC for this project. She is responsible for assisting in the writing and approval of the QA Project Plan and providing consultation on the final evaluation of the validated data. The EPA **Regional Sample Control Coordinator** (RSCC) coordinates sample analyses performed through the EPA Contract Laboratory Program (CLP) and/or the EPA Manchester Environmental Laboratory (MEL), provides sample identification numbers, project code, and reviews the project Scribe deliverables to verify the R10 Data Management Plan requirements have been met.

Gina Grepo Grove, Regional QA Manager, will be responsible for reviewing and approving all Quality Assurance Project Plans (QAPPs). QA Chemists residing in the OEA ESU have delegated authority to review and approve Quality Documents in place of the R10 RQAM.

Jeff Rodin, On Scene Coordinator, will oversee START project work and sampling as the START Task Monitor.

Lon Kissinger, EPA human health risk assessor, will consult on sample collection and analysis activities as they may affect use of the data for human health risk assessment.

Michael Worden, START Project Manager, will conduct sampling and conduct START project work. He will coordinate directly with the EPA RSCC for lab scheduling, sampling updates, Scribe, and documentation issue resolution. He will manage the scribe project file.

Renee Nordeen will be the START sampling coordinator and data manager.

The Field Sampling Team is composed of START contractor field staff. Field personnel are responsible for performing the field work, including collection, preparation, and shipment of samples and completion of field sampling records. The Field Sampling Team will include scientific staff with specialization and technical competence in field sampling activities to effectively and efficiently perform the required work. They must perform all work in adherence with the project task, R10 DMP, and QAPP. In this role, Field Sampling Teams are responsible for:

- receiving and inspecting the sample containers,
- completing and signing appropriate field records,
- collecting field samples as specified
- assigning tracking numbers to each sample,
- verifying the completeness and accuracy of chain-of-custody documentation,
- controlling and monitoring access to samples while in their custody, and
- initiating shipment of the samples to appropriate destinations.

1.3 Problem Definition/ Background

Rainier Commons is working under an approval to remove PCB contaminated paint from exterior surfaces of the buildings. The approval requires that Rainier implement control measures such as conducting work under negative containment and preventing the release of blast media and paint into tenant spaces through the use of poly sheeting over tenant window, both inside the tenant space and on the exterior side of the window. Additionally, Rainier is required to conduct particulate monitoring inside spaces where active blasting is occurring and outside, down-wind of the containment structure. These controls are the same as those recommended in EPA guidance to contractors handling PCB bulk product, and many of these controls are similarly employed at asbestos remediation sites. Blasting activities concluded August 19, 2014. On September 24, 2014, the EPA PCB Coordinator received a call from an attorney for one of the tenants, expressing concern that dust had entered the tenant space as a result of a breach of containment. On October 2, 2014 a second tenant contacted EPA regarding concerns that dust may have entered their space as a result of blasting activities. On October 5th, 2014 a third tenant contacted EPA expressing concerns that dust related to blasting activities may have entered tenant space. EPA then visited the site, and met with two tenants on October 6, 2014. During this visit, no visible dust was observed in the windowsills or floor under the windows. It was confirmed that Rainier cleaned the window areas. One tenant hired a consultant who collected samples and photographs prior to EPA's visit which raise the question as to whether or not a breach occurred, and whether or not Rainier's standard clean-up practices were sufficient to protect human health and the environment. To

this end, it must be determined if the cleaning activities that Rainier employed in the tenant spaces were effective in mitigating risk to potential PCB exposure from blasting activities.

This QAPP is therefore developed to address the sampling and analysis needs of the dust sampling and the appropriate QC activities that will be included during sampling and analysis.

1.4 Objectives/Scope

The objective of this project is to characterize PCB concentrations in dust and on surfaces within commercial and residential spaces within RC, and correlate these concentrations with blasting activities. The data collected is anticipated to be of sufficient quantity and quality to be used by EPA for assessment of human health risks and adherence to the PCB regulations and December 18, 2013 Risk Based Disposal Approval and all corresponding Amendments.

1.5 Project Description

1.5.1 Project/Task Description

PCB levels within RC will be characterized by collecting and analyzing dust and surface residue samples. Association of PCB concentrations to blasting activities will be conducted through co-locating wipe samples for blasting media metals and lead. Metals concentrations will be compared to each other in order to determine if the dust particles are characteristic of sandblast media. PCB concentrations will be compared to the metals data in order to determine if there is a positive association or possible trend. PCB concentrations will also be compared against the Risk Based Analytical Concentration Goals described in Appendix B. Three types of samples will be collected:

1. Hexane wipe samples from surfaces that have not been vacuumed for PCB analysis,
2. Ghost wipe samples from surfaces that have not been vacuumed for metals analysis.
3. Dust samples collected with Nilfisk vacuums for PCBs and metals analysis

Samples will be used to characterize PCB and metal concentrations in dust.

1.5.2 Schedule of Tasks and Activities

Table 42: Activity Schedule and Tentative Start and Completion Dates

Activity	Start-End Dates	Comments
Preparation, review and approval of QAPP	End: 11/10/2014	
Laboratory Coordination	11/1/2014	
Mobilization to Site	11/12/2014	
Sample Collection	11/12/2014	
Lab Analysis	8 weeks	Estimated
Data Reconciliation/ Use Assessment	2 week	Estimated

Data Reporting		

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1.6 Quality Objectives and Criteria for Measurement Data

The data will primarily be used to make the determination if an adverse risk to PCBs from blasting activities exists. Data Quality Objectives are summarized in Table 5 of this QAPP.

Data quality objectives (DQOs) are qualitative and quantitative statements that clarify the intended use of the data, define the type of data needed to support the decision, identify the conditions under which the data should be collected, and specify tolerable limits on the probability of making a decision error due to uncertainty in the data. DQOs are developed by data users to specify the data quality needed to support specific decisions. DQOs for measurement data (referred to here as data quality indicators) are precision, accuracy, representativeness, completeness, comparability, and measurement range. The overall QA objective for analytical data is to ensure that data of known and acceptable quality are provided. To achieve this goal, data must be reviewed for 1) representativeness, 2) comparability, 3) precision, 4) accuracy (or bias), and 5) completeness. Precision, accuracy, completeness, sample representativeness and data comparability are necessary attributes to ensure that analytical data are reliable, scientifically sound, and legally defensible. Each analytical result or set of results generated should be fully defensible in any legal action, whether administrative, civil or criminal.

Commented [MM2]: Jennifer- I'm not really sure what Lon is asking here, is this directed at you, do you think?

Commented [KL3]: Where would necessary reporting limits come in here?

Precision: Precision is a measure of internal method consistency. It is demonstrated by the degree of agreement between individual measurements (or values) of the same property of a sample, measured under similar conditions.
The precision of the analyses are measured by monitoring the relative percent differences between duplicate measurements. Laboratory precision and accuracy can be measured by the laboratory measuring Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples and the analysis of laboratory duplicate samples. Laboratory MS/MSD analyses are usually performed on a 5% frequency (1 per 20 samples) while field duplicate samples analyses are performed at a 10% frequency (1 per 10 samples collected). However, lab duplicate and MS/MSD analyses are not appropriate for wipe samples which represent a specific area measured and cannot be split or cut at the laboratory. A field duplicate is also not appropriate for the dust samples in this project, as the vacuum will remove all material from the area to collect the first sample. Field and analytical precision are evaluated by the calculating the relative percent difference (RPD) between field duplicate samples, laboratory duplicate samples, and laboratory control samples (where appropriate / applicable). Relative Percent Differences are calculated using the following formula:

$$RPD = \frac{ABS(R1 - R2)}{[(R1 + R2)/2]} \times 100$$

R1 = Recovery for MS or duplicate 1
R2 = Recovery for MSD or duplicate 2

Specific project criteria for precision are identified in the DQO Summary - Table 5.

Accuracy (Bias): Accuracy is defined as the degree of agreement between an observed value and an accepted reference or true value. Accuracy is a combination of random error (precision) and systematic error (bias), introduced during sampling and analytical operations. Bias is the systematic distortion of a measurement process that causes errors in one direction, so that the expected sample measurement is always greater or lesser to the same degree than the sample's true value.

Accuracy will be evaluated by the using percent recovery (%R) of the target analyte in spiked samples (MS/MSD) and also the recoveries QC samples. Field blanks and method blanks are also used as indicators of accuracy and potential bias in the sample results. Percent recoveries are calculated as follows:

$$\% \text{ Recovery} = \frac{SQ - NQ}{S} \times 100$$

SQ = quantity of spike or surrogate found in sample
NQ = quantity found in native (un-spiked) sample
S = quantity of spike or surrogate added to native sample

Specific project criteria for accuracy are identified in the DQO Summary - Table 5.

Representativeness: Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter, variations at a sampling point, a process condition, or an environmental condition. Representativeness of samples is ensured by adherence to standard field sampling protocols and standard laboratory protocols. The design of the sampling scheme and number of samples should provide a representativeness of each matrix or product of the chemical processes being sampled.

Comparability: Comparability is an expression of the confidence with which one data set can be compared with another. Comparability is dependent on the proper design of the sampling program and on adherence to accepted sampling techniques, standard operating procedures, and quality assurance guidelines. This is measured and achieved by using the same matrix, sample location, sampling techniques and analytical methodologies.

Completeness: Completeness is the percentage of valid results obtained compared to the total number of samples taken for a parameter. Since sampling are grabs and limited in number, the number of valid results obtained from the analyses are expected to be 100%. The % Completeness may be calculated using the following formula:

$$\% \text{ Completeness} = \frac{\text{\# of valid results}}{\text{\# of samples taken}} \times 100$$

The QA objectives outlined, above, will be evaluated in conjunction with the data validation process.

1.7 Special Training Requirements/Certification

Samplers need to have a proper training in the collection of dust samples using the Nilfisk vacuums and in the collection of wipe samples. They need to be proficient in the use of Scribe and in R10 documentation requirements (R10 DMP, 2014). A procedure describing the vacuum and wipe collection processes is provided in Section 2.2. General safety precautions will be followed.

The analysts performing the analytical work for this project have extensive knowledge and skill in the execution of the analytical methods being requested.

Documentation and Records

This document is meant to be combined with information presented in E & E's (2013b) Region 10 START-IV *Quality Assurance Project Plan* and the information provided in SOPs (Appendix A). A copy of the START-IV QAPP is available in E & E's Seattle office. Standards contained in the SOPs, the START-IV QAPP, and the QMP will be used to ensure the validity of data generated by E & E for this project. The minimum required data to be recorded is identified in the sampling procedures and the R10 Data Management Plan (2014). Thorough documentation of all field sample collection and handling activities is necessary for proper processing in the laboratory and, ultimately, for the interpretation of results.

Required sample collection, locational data, monitoring data, shipment, chain of custody documentation, and final validated results will be recorded electronically in the Scribe project file by EnE (EPA R10 DMP, 2014). Samples will be shipped from the field to the EPA R10 laboratory (MEL) via priority, overnight express delivery service or will be hand delivered to the lab.

Field logbooks (or daily logs) and data forms are necessary to document daily activities and observations. All data and observations are hand documented in a field logbook. Documentation will be sufficient to enable participants to reconstruct events that occurred during the project accurately and objectively at a later time. All daily logs will be kept in a bound notebook containing numbered pages. All entries will be made in waterproof ink, dated, and signed. No pages will be removed for any reason.

Minimum logbook content requirements are described in the E & E SOP entitled *Field Activity Logbooks,* provided in Appendix C. Any necessary corrections will be made by drawing a single line through the original entry (so that the original entry is legible) and writing the corrected entry alongside. The correction will be initialed and dated. Corrected errors may require a footnote explaining the correction. Documentation records need to be complete such that the analytical results can be traced to a dust sample obtained from a known location on a specific date. Any field notes deemed necessary to complete this documentation needs to be maintained with the site file.

Photographs of sample locations may also be used to clarify the types of surfaces where dust samples were obtained. Documentation of a photograph is crucial to its validity as a representation of an existing situation. As applicable, the following information will be noted in the project or task log concerning photographs:

- Date, time, and location where photograph was taken;
- Photographer (signature);
- Description of photograph taken;
- Reasons why photograph was taken;
- Sequential number of the photograph

The following documents will be archived at the laboratory performing the analyses: (1) signed hard copies of sampling and chain-of-custody records (2) electronic and hard copy of analytical data including all supporting documentation - extraction and sample preparation bench sheets, raw data and reduced analytical data.

The laboratory will store all sample receipt, sample login, extraction/preparation, and laboratory instrument print-outs and other analytical documentation as per their established SOPs.

2 Measurement/Data Acquisition

2.1 Sampling Process Design (Experimental Design)

Tenant concerns were reported to EPA for units 10-400, 10-300, 10-200 and 11-200. EPA reached out to two other tenants in building 10 and 11 and received one response requesting no follow-up sampling. Samples will be collected in the 4 units listed above. PCB wipe samples will be co-located with wipe samples for metals analysis. Bulk dust will also be collected with a Nilfisk vacuum at the same general location as wipes. Priority shall be to collect wipe samples prior to bulk dust samples. Samples will be collected at the windowsills and floor underlying the windows, as well as at a mid-way point in the room between the window and the opposite wall, and then at the back of the room near the wall opposite the window. Priority will be given to sampling shelving above the eye-line, where available. Rainier Commons will collect wipe samples at all locations. ~~, while~~ EPA will collect one split hexane wipe sample and one split ghost wipe sample per Unit ~~samples~~ in order to verify Rainier's sample results. Split samples will be collected immediately adjacent to the location that Rainier Commons collects a wipe sample. Therefore, splits will not be truly "split" but should be comparable, though there will be some natural variation due to the heterogeneous nature of dust. ~~at only one location per unit.~~ If non-household dust is identified by orange or brown coloration or sand-size grains, and the volume is approximately greater than 1 gram, EPA will collect a bulk dust sample with the Nilfisk vacuum. If the volume is approximately less than 1 gram, Rainier Commons will collect wipe samples. If there is sufficient area that EPA can collect a split wipe sample set, EPA will do so. The purpose is to determine if cleaning at the windowsill/floor after blasting activities ceased was sufficient to protect human health from blasting activity related PCBs.

2.2 Sample Collection Methods

Refer to Appendix A of this QAPP for the Standard Operating Procedure (SOPs) for the collection, sieving and processing of vacuum dust and wipe samples.

2.3 Description of samples to be taken

2.3.1 Sample coding

All samples will be identified using the sample numbers assigned by the EPA RSCC. Each sample Scribe label will be affixed to the jar or container provided and covered with clear tape. A sample tracking record will be kept as each sample is collected. In addition to the EPA-assigned sample number, samples will be tracked with an EnE sample code system designed to allow easy reference to the sample's origin and type. The sample code key will not be provided to the laboratory. The table below (Table 3) summarizes sample coding for this project. The sample locational data must be imported into Scribe and a regenerated COC XML and XLS file provided to EPA RSCC/SMO Portal/Scribe.net within 14 days of the last shipment. Field sample identification will be sufficient to enable cross-reference with the project logbook. For chain-of-custody purposes, all QA/QC samples will be subject to the same custodial procedures and documentation as site samples.

2.3.2 Description of locations where samples are to be taken

Figures 1 is a diagram of the Rainier Commons Complex with a circle around the buildings where samples are to be taken. Rainier Commons will collect samples at all locations while EPA will collect samples at only one location within each unit listed in Table 3. A separate attachment includes the floor plans and approximate locations of each sample collection point.

Table 5~~3~~: Description of sample locations

Building	Location	Carpeted = "C" Non-carpeted = "NC"	Description of location`
10	10-400	NC	Fourth floor 1-bedroom apartment.
10	10-300	NC	Third floor studio loft
10	10-200	NC	Second floor office space
11	11-200	NC	Second floor office space

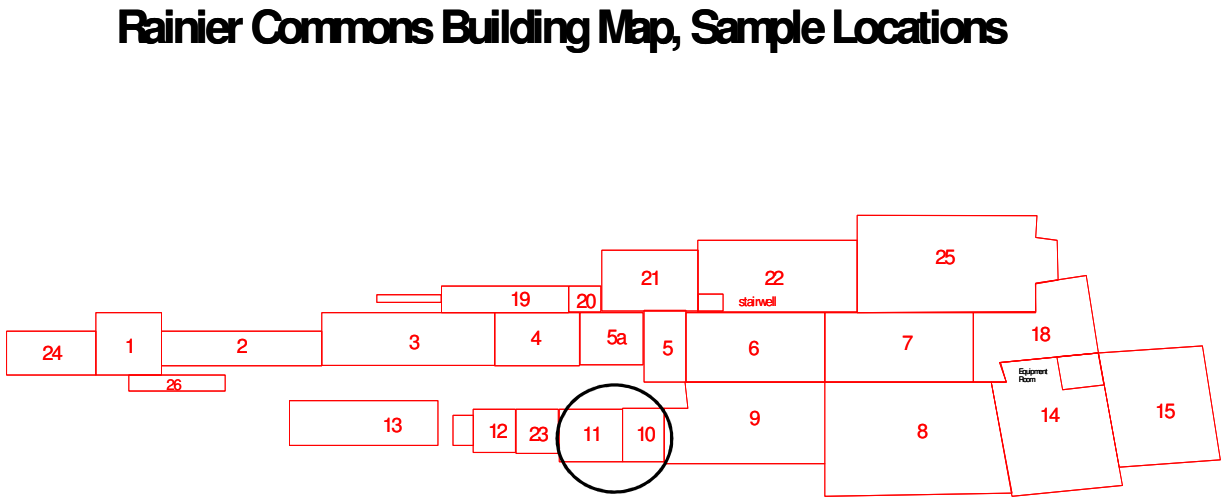
2.3.3 Description of types of samples to be taken at each location

At each location, three samples will be taken:

1. A hexane wipe sample adjacent, which was not vacuumed for a PCB dust sample.
2. A ghost wipe sample adjacent to the hexane wipe sample from an area that was not vacuumed or wiped, for a metals dust sample.
3. A dust sample collected by Nilfisk UZ-964 vacuum on an X-Cell 100 dust sock filter.

Hard surfaces are to be preferentially sampled. In each unit all three sample types will be co-located. Samples will be collected 1) on each windowsill, 2) on the floor underneath the windowsill, 3) at a point mid-way between the wall with the windows and the back of the room 4) at the back of the room. Surfaces other than the floor are preferred for the mid-point and back of room samples, to control for PCBs present from blasting media vs. track-in from outside. Priority will be given to sampling shelving above the eye-line, where available. Rainier Commons will collect all sample types at all sample locations. EPA will collect all sample types at only one location in each unit, as described in section 2.1. Bulk ~~D~~dust samples will only be collected by ~~Rainier and~~ EPA where visual evidence of orange dust or brown sandy grit is identified and approximate volume is greater than 1 gram. If non-household dust is observed with approximate area less than 1 gram, the dust will be sampled by wipe methodologies. ~~To this end~~Bulk dust sampling may not occur in every unit, if only household dust is observed. ~~, a dust sample may not be collected at each sampling location in each unit.~~

Figure 1:


Rainier Commons Building Map, Sample Locations
24
1
26
2
3
4
5a
5
19
20
21
22
stairwell
25
6
7
18
Equipment Room
13
12
23
11
10
9
8
14
15

2.4 Sample Handling and Custody Requirements

The purpose of these procedures is to ensure that the quality of the samples is maintained during collection, transportation, storage, and analysis. All chain-of-custody requirements comply with E & E's SOPs for sample handling and EPA Region 10 sample management / Scribe requirements. Sample containers and labels should be prepared ahead of time to the extent possible in accordance with R10 guidance.

Proper labeling of samples is a very important QA aspect and cannot be overstressed. All sample containers for a site should be pre-labeled prior to arriving on station. Pre-labeling clean, dry containers helps to ensure that labels adhere properly to the containers.

A Chain-of-Custody Form, printed from the Scribe project file, acts as a record of sample shipment and a catalog of the contents of each shipment (coinciding with information on the field record). The original signed COC is sealed inside the shipping container. Shipping/delivery notification to the RSCC on the day of relinquishment is required – information on regional requirements may be found in the DMP appendices (2014).

Upon receipt of the samples, the analytical Laboratory will record the arrival time on the chain of custody form. They will upload the Scribe COC XML file to the LIMS electronically after check in. Any observations regarding the shipment (e.g., torn or damaged packaging, insufficient dry ice) also will be documented on the chain of custody form.

Samples will be shipped via FedEx to EPA's Manchester Environmental Laboratory by EnE on the day of or day following sample collection.

Custody seals are preprinted gel-type seals that are designed to break into small pieces if disturbed. Sample shipping containers (e.g., coolers) will be sealed in as many places as necessary to ensure security (typically 2 outside and 1 internal). Seals will be signed and dated before use. Clear tape may be placed perpendicularly over the seals on the cooler seam to ensure that they are not broken accidentally during shipment. An internal custody seal also will be signed and placed over the taped-closed cooler interior "drum liner" bag that encloses all cooler contents. Clear tape will be placed over the seals to ensure that they are not broken accidentally during shipment. Upon receipt at the laboratory, the custodian will check (and certify by completing the package receipt log) that seals on shipping containers are intact.

The primary objective of chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection to completion of all required analyses. A sample is in custody when it is:

- In someone's physical possession,
- In someone's view,
- Locked up, or
- Kept in a secured area that is restricted to authorized personnel.

2.5 Analytical Methods Requirements

The analytical methods that will be used for this project are specified in Table 2 of this QAPP. The EPA R10 laboratory (MEL) will perform all requested analysis for the EPA split samples collected in this event.
MEL laboratory analysis and MEL QA chemist data validation for samples submitted to MEL will take place in an eight-week turnaround time period or as specified by the lab upon acceptance of the project for analytical support. Electronic results from MEL will be delivered to the EPA and START identified personnel upon completion. Final EDD results from MEL will be delivered to the EPA upon project completion. Table 5 summarizes laboratory instrumentation and methods to be used for the NWS&S SI.

For cases in which laboratory results exceed QC acceptance criteria, reextraction and/or reanalysis will occur as indicated in the applicable analytical method. The respective laboratory analysts will be responsible for ensuring that appropriate sample analysis procedures are followed and for taking appropriate actions to ensure deficiency correction.

2.6 Quality Control Requirements
Routine Quality Control measures associated with the methods specified in Table 2 will be followed for each analysis.

QC checks for sample collection will be accomplished by a combination of chain-of-custody protocols and laboratory QA procedures as prescribed in the sampling or analytical methods. No QC samples (i.e., double blind performance evaluation samples) are planned for this activity outside of the normal laboratory QC criteria outlined in the analytical methods. These QC samples include blanks (field and laboratory method), field duplicates (where applicable) and method-specified lab QC. Lab duplicate and MS/MSD analyses are not appropriate for wipe samples which represent a specific area measured and cannot be split or cut at the laboratory. A field duplicate is also not appropriate for the dust samples in this project, as the vacuum will remove all material from the area to collect the first sample. Results from these samples will be compared to the QC requirements indicated. All analyses that will be performed for this project will produce definitive data. DQI targets for this project are specified in section 1.6 and precision and accuracy requirements are summarized in Table 5 of this QAPP. Bias for estimated qualified data will be determined by the validation process in accordance with the objectives outlined in this document and the validation stages defined by the EPA (2009).

2.7 Instrument/ Equipment Testing, Inspection, and Maintenance Requirements
All instrument/equipment testing, inspection and maintenance will follow the standard operating procedures for any preventative maintenance required on laboratory instruments specified in the laboratory's QA Manual.
The field equipment to be used during this project includes the GPS unit, and a vacuum for collecting dust samples. Testing, inspection, and maintenance of these instruments (where appropriate) will be performed in accordance with the manufacturers' recommendations and/or the SOPs listed in Appendix A.

All equipment used by E & E in the field is subject to standard preventive maintenance schedules established by corporate equipment protocols. When in use, equipment will be inspected at least twice daily: once before startup in the morning and again at the end of the work shift before overnight storage or return to the charging rack. Regular maintenance, such as cleaning of lenses, replacement of in-line filters,

and removal of accumulated dust, is to be conducted according to manufacturers' recommendations and in the field as needed, whichever is appropriate. All performed preventive maintenance will be entered in the individual equipment's logbook and in the site field logbook.

2.8 Instrument Calibration and Frequency

All instruments and equipment used during fixed laboratory sample analyses will be operated, calibrated, and maintained according to the manufacturers' guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references and/or in accordance with the laboratory's QA manual and SOPs.

2.9 Inspection/ Acceptance Requirements for Supplies and Consumables

This information is covered by the SOPs, the START-IV QAPP (E & E 2013b), and the START-IV QMP (E & E 2013a). Standards contained in these documents will be used to ensure the validity of data generated by E & E for this project. Sample jars are pre-cleaned by the manufacturer; and certification documenting this is enclosed with each box of jars. The START-IV will include this documentation as part of the site file. Nondedicated equipment is demonstrated to be uncontaminated by the use of rinsate blanks. Wipes have been provided by the EPA R10 lab, along with containers in which to return them for direct digestion/extraction. Hexane wipes have been pretested for PCBs; ghost wipes are certified clean for the metals of interest.

2.10 Data Acquisition Requirements (Non-Direct Measurements)

There will be no non-direct measurements for this project.

2.11 Data Management

This document is meant to be combined with information presented in E & E's QAPP and QMP for Region 10 START-IV and the requirements in the R10 Data Management Plan (2014). Copies of the START-IV QAPP and QMP are available in E & E's Seattle office. Standards contained in these documents will be used to ensure the validity of data generated by E & E for this project. Data validation will be performed as identified. Electronic data will be archived by TDD. Additionally, all locational, field collection/sampling, shipment, custody, monitoring, and laboratory/field analytical data will be included in the project's Scribe file and will be sent to the RSCC and will be published to Scribe.net within two weeks of the conclusion of the field event, in accordance with the R10 DMP (2014).

3 Assessment/Oversight

3.1 Assessments and Response Actions

The START PM will be responsible for reviewing field log notebooks for accuracy and completeness within 48 hours of the sampling event. Sample results provided to the PM by the laboratory will be appended to the project reports. The PM will compare the sample information in the field log notebooks with the analytical results appended to the inspection report to ensure that no transcriptions errors have occurred.

If major deviations from the QA requirements of the project and the CLP SOW were observed in the data validation process, the EPA QAO will contact the laboratory to correct the problem. If the laboratory is not responsive to the request, the QAO will inform the CLP Regional PO and the TM of the situation. A brief narrative will be written explaining the contract deviations, and recommendations will be given based on the quality of the submitted data. Reduced payment and/or reanalysis at the laboratory's expense may be pursued by the Regional CLP PO. Re-sampling and subsequent re-analysis will be decided by the TM. Additional sampling for corrective actions and/or any addendum to this SQAP shall be documented using the Corrective Action Form and the SPAF (Appendix B). Corrective actions will be conducted in accordance with E & E QMP specifications.

Unavoidable deviations from the procedure set forth in the QAPP shall be documented in the Sample Alteration Plan (Attachment 1) and approved by the Project PM and the QA Officer prior to implementation. Corrective action procedures that might be implemented from QA results or detection of unacceptable data will be developed if required and documented in Attachment 2.

3.2 Reports to Management

The START-IV PM will debrief the EPA TM on a daily basis. Laboratory deliverables (EDD) will be as specified in the R10 DMP and the lab SOPs. Once the project is complete and the resulting data obtained, the START-IV PM will prepare a final project report. The report will include a summary of the activities performed during the project and the resulting data (along with any statements concerning data quality). The report will be approved by the EPA TM prior to being forwarded to the individuals identified in the data distribution list located in the Table of Contents section of this SQAP.

The START-IV corrective action program is addressed in Section 3 of the QMP. Corrective actions will be conducted in accordance with these QMP specifications. A corrective action form is attached to this QAPP.

4 Data Validation and Usability

4.1 Data Review, Validation, and Verification Requirements

The criteria for the review and/or validation will follow those specified in this QA plan and the criteria specified in the methods. The data validation review of data packages will include an evaluation of the information provided on the analytical data sheets and required support documentation for all sample analyses; the supporting sample collection documentation, including chain-of-custody forms; and documentation of field instrument calibration, sample results, and/or performance checks (if required by the method). The QA review also will examine adherence to the procedures as described in the cited SOPs and the specified analytical methods in the SQAP.

4.2 Validation and Verification Methods

All data generated shall be reviewed in accordance with the QA/QC requirements specified in the methods, the technical specifications outlined in the QAPP and as applicable, the most recent Functional Guidelines for Inorganic and/or Organic Data Review and the "*Guidance for Labeling Externally Validated Analytical Data for Superfund Use, OSWER 9200-.1-85, EPA-540-R08-005, January 2009"*. The summary of all analytical results will be reported to the RCO. The raw data for this project shall be maintained by the laboratory. Data review will be performed by the laboratory for all the analyses prior to

the release of data. The laboratory will also archive the analytical data into their laboratory data management system.
Data generated by the MEL will be reviewed, and qualifiers will be applied by staff at the MEL equivalent to 100% Stage 4 (S4VM - EPA, 2009). When applicable, QC criteria listed in the applicable analytical methods and/or the SOW (Appendix D) will be used for validation. Sample qualifications based on field blank results (when collected) will be applied in the same manner as qualifications based on laboratory method blank results.

Validation deliverables will include a QA memo discussing QA conformance and deviation issues that may have affected the quality of the data. Data usability, bases of application of qualifiers, and percentage of qualified data will also be discussed in the QA memo. The analysis data sheets (Form I or equivalent) with the applied validation qualifiers will also be a part of the validation deliverables.

4.3 Reconciliation with User Requirements

All data and related information obtained during the course of this project will be included in a data report package to be submitted to the Project Manager. Results of the validated analytical data will reviewed against the project's data quality objectives for accuracy (adequate reporting limits) and completeness.

4.4 Data Qualifiers and Data Validation Report

Based on the results of the DQO assessments performed, bias and usability of the reported results will be evaluated and discussed in a Data Validation memo. Analytical results will be qualified using the following qualifiers as a result of the data validation:

Table 64: Data qualifiers

U	The material was analyzed for but was not detected at or above the reported result. The associated numerical value is the sample quantitation or reporting limit.
J	The associated numerical value is an estimated quantity because the reported concentrations were less than the sample quantitation limits or because quality control criteria limits were not met.
UJ	The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample because QC criteria were not met.
R	The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

Table 5: Summary of Data Quality Objectives

Total Samples[1]	Matrix	Parameter	# QA Samples	Matrix	Container	Holding Time	Preservation	Method	Reporting Limit[2]	Precision	Accuracy
5	Dust	PCB Aroclors	1 filter blank	Dust	Glass Jar (shared)	14 days extraction / 40 days analysis	none	EPA 8082	0.1 mg/kg	50% RPD	50-150%
5	Dust	Metals: Cr, Cu, Ni, Pb, Zn	1 filter blank	Dust		180 days	none	EPA 3050B + 6010B/6020A	TBD	50% RPD	70 - 130%
6	Hexane Wipe	PCB Aroclors	1 wipe blank & 1 field duplicate	Surface residue	Wipe / Glass Jar	14 days extraction / 40 days analysis	none	EPA 8082	0.5 µg/wipe	50% RPD	50-150%
6	Ghost Wipe	Metals: Cr, Cu, Ni, Pb, Zn	1 wipe blank & 1 field duplicate	Surface residue	Wipe / Glass Jar	180 days	none	EPA 3050B + 6010B/6020A	TBD	50% RPD	50-150%

[1] Total number of samples includes field QC (field duplicate, blanks)

[2] The bases for the specified reporting limits are included in Appendix B.

Attachment 1

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Sample Alteration Form

Project Name and Number:_____

Material to be Sampled:_____

Measurement Parameter::_____

Standard Procedure for Field Collection & Laboratory Analysis (cite reference):

Reason for Change in Field Procedure or Analysis Variation:

Variation from Field or Analytical Procedure:

Special Equipment, Materials or Personnel Required:

Initiators Name:_____ Date:_____

Project Manager: _____ Date:_____

QA Officer:_____ Date:_____

Attachment 2

Corrective Action Form

Project Name and Number:_____

Sample Dates Involved:_____

Measurement Parameter:_____

_____

Acceptable Data Range:_____

_____

Problem Areas Requiring Corrective Action:

_____

_____

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Measures Required to Correct Problem:

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Means of Detecting Problems and Verifying Correction:

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_____

Initiators Name:_____ Date:_____

Project Manager: _____ Date:_____

Appendix A: Dust Sampling and Processing Procedures

1 Vacuum Dust Collection

1.1 Materials for Vacuum Dust

1. Isopropyl alcohol
2. Waste container with cap for isopropyl alcohol
3. Disposable gloves
4. KimwipeTM
5. Measuring tape and masking tape
6. Housedust Sample Data Sheets
7. Sharpie and sample labels
8. Field notebook
9. Nilfisk UZ 940
10. Nilfisk UZ 940, vacuum cleaner accessories (vacuum cleaner bags, polyliner bags, straight steel wand, 32-mm anti-static vacuum hose, 32-mm anti-static vacuum hose coupler components, and 5" upholstery nozzle)
11. Extension cord
12. Adapter (3-prong to 2-prong)
13. Vacuum template (0.5 m x 0.5 m template) (Some may be constructed on site)
14. Ziplock plastic bags (9" x 13")
15. Regular pen
16. Storage boxes (for transporting supplies)
17. Paper towels
18. Clamp for gauze to decontaminate wand

1.2 Pre-field Preparation

Clean the Nilfisk vacuum hoses, curved plastic tubes, and upholstery nozzles with soap and water, tap water rinse and solvent rinse with ethyl alcohol.

1.3 Collecting Dust Samples:

1. This methodology should only be employed where at least 1 gram of non-household dust is observed. If 1 gram of dust is not available, only wipe methodologies should be implemented. Non-household dust is visually identified by orange or brown color, or sand-size grains.
2. Insert a pre-weighed sample collection sock over the end of the metal tube at the tip of the vacuum hose, folding back a circle of material so that it surround the metal tube.
3. Fit an upholstery nozzle over the metal tube at the tip of the vacuum hose, thereby securing the sample collection sock in place.
4. Where orange dust or brown sandy grit is visually observed, use masking tape to delineate the area to be sampled.
5. Using the Nilfisk vacuum cleaner unit hooked up to the upholstery nozzle, vacuum the marked out area in a repetitive fashion (up, down, over; repeat (see diagram below)). Once the entire area has been vacuumed, vacuum the same area again in the same manner, but in a perpendicular direction to what was originally done (see diagram below). Completion of

this procedure will ensure that each area within the vacuuming template will have been vacuumed over four times.

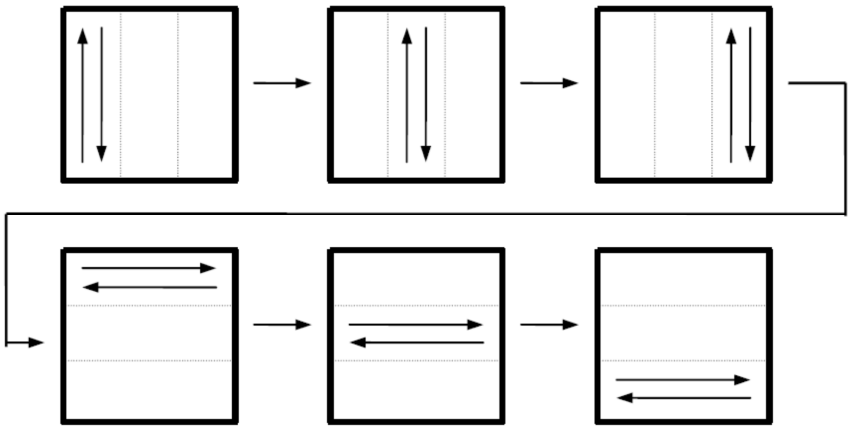

Figure 2: Procedure for vacuum collection of dust samples

Use the following floor, room, and area preference lists/protocols to help make decisions during the vacuuming procedure:

A. Surface Preference
   1. Window sills
   2. Smooth floors at windows
   3. Shelves above eye-line at mid-point and back of room
   4. Smooth floors at mid-point and back of room if necessary

B. Room Preference
   1. Living/common room
   2. Kitchen/dining area
   3. Bedroom
   4. Use your judgment and be sure to record your choice

6. Record this information on the sample datasheet. Record on the Housedust Sample Data Sheet the location and size of the sample area. Transfer the sample sock to a clean glass jar.

7. Place the house dust sample into a storage box or cooler (36 qt) for transfer to the Field Base. No ice is necessary.

8. After removing the sample sock, with a slightly moistened paper towel (use deionized water from the squeeze bottle), wipe clean the metal vacuum

2 Wipe Sample Collection for Characterization of Dust and Residue Concentrations

2.1 Materials

1. Bag, plastic, sealable with "zip" type seal.
2. Glass sample container
3. Gauze: 4" x 4" cotton gauze
4. Gloves: Natural Latex Rubber, Nitrile, or Neoprene
5. Solvent: Hexane
6. Template Plastic sheet or cardboard: 100 cm^2

2.2 Surface Wipe Technique

1. The wipes come pre-moistened in either hexane (PCB analysis) or De-Ionized Water (Ghost Wipes). Remove the wipe from its container.

2. Place the template over the area to be sampled or measure out a 100-cm2 surface area.

3. (SEE Figure 2) Wipe the surface with firm pressure, using 3 or more S-strokes (in one direction, covering the entire surface). Fold the exposed side of the pad or filter inward (i.e. fold in half). If the surface is very rough, a dabbing action may be substituted for the S-stroke wipe. Indicate dabbing done on

4. Using the once-folded media, wipe the same area with S-strokes at right angles to the first wipe. Fold the exposed side of the pad or filter in.

5. Using the twice-folded media, wipe with S-strokes in the original direction. Fold the exposed side of the pad or filter in.

6. Place the hexane wipe in a glass jar. Place the ghost wipe in a digestion tube. Place the glass jar or digestion tube in a zip lock and seal the zip lock. Record the sample identification on the bag or vial.

7. Discard paper templates in preparation of the next sample. Based on testing of templates of similar material, templates can be disposed as normal trash.

8. Remove gloves and discard appropriately before handling the next filter or pad.

9. Record the sample identification, surface area sampled, and description of the sample and surface,

10. Include 1 blank filter or pad (moisten and placed in bags or vials) with each set of samples (provide 1 blank per 6 samples).

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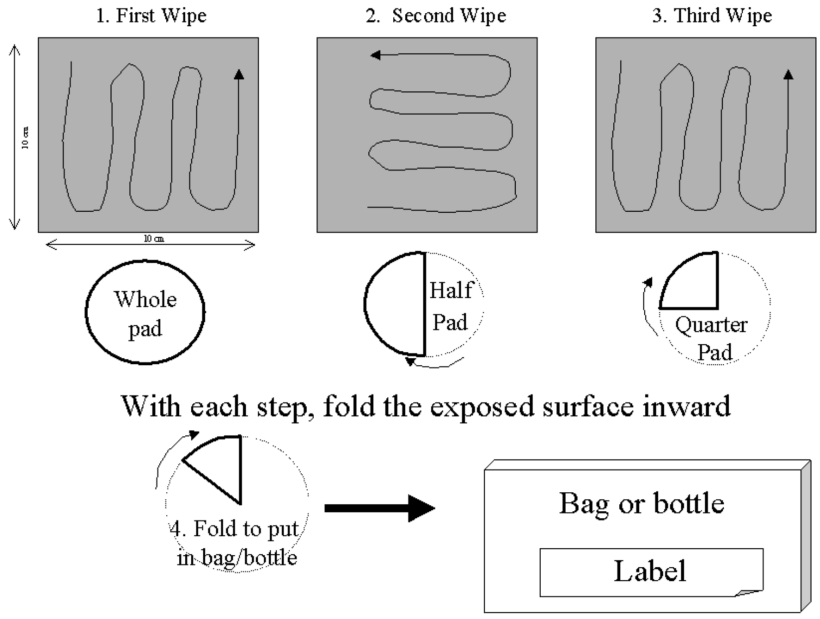

Figure 3: Wipe Sample Collection Procedure

Appendix B - Rainier Vacuum Dust and Wipe Sampling Risk Based Analytical Concentration Goals (RBACGs) and Analysis of Risks

1. Introduction

Analytical detection limits for PCBs in building dust samples from the Rainier Commons project must be sufficiently low to detect limits of public health concern. However, PCBs are wide spread contaminants. It is hence also important to consider how PCB risk based analytical concentration goals (RBCAGs) compare with levels that are commonly found in building dust.

2. Considerations in Developing PCB Dust RBACGs

2.1. Levels Found in Building Dust

Several studies have evaluated PCB concentrations in building dust. PCB house dust concentrations were measured in homes in close proximity and some distance away from New Bedford Harbor PCB dredging operations. Concentrations ranged from 0.26 to 23.0 mg/kg. In nine Seattle Washington home, house dust PCB concentrations ranged from 0.24 to 0.76 mg/kg. Eight Columbus Ohio homes had PCB concentrations ranging from 0.210 to 1.9 mg/kg (ATSDR 2000). Harrad et al. (2009) measured average house dust concentrations in several locations and obtained the following average concentrations (location/concentration in mg/kg): Austin Texas/0.220, Birmingham UK/0.110, Toronto Canada/0.290, Wellington New Zealand/0.067. Harrad et al. (2009) also noted results for a study of house dust in Singapore that found a value of 0.092 mg/kg, which is lower than concentrations noted in other studies. In the Washington State Department of Health's evaluation of PCB house dust exposure for two homes near the T117 Superfund site in Seattle Washington, PCB concentrations (mg/kg) of 0.756 to 1.57 and 0.891 to 1.03 were obtained (WA DOH 2006). The WA DOH dust samples were sieved to obtain a fraction consisting of 150 microns or less in particle diameter. This was done in order to have a sample that reflected the properties of dust particles that might adhere to skin or that might be incidentally ingested.

2.2. Building Dust Exposure Risks

Cancer risks and non-cancer hazards were evaluated at house dust PCB concentrations of 0.25 and 1.0 mg/kg, as these values were relatively typical of PCB concentrations found in homes. Risks and hazards were evaluated for incidental ingestion of house dust, dermal exposure to house dust, and combined ingestion and dermal exposure. Both adult and child exposures were evaluated. Details of this analysis are presented in the attached appendix.

At all house dust PCB concentrations evaluated, all non-cancer hazards were below EPA's acceptable hazard quotient of 1.

At a house dust PCB concentration of 0.25 mg/kg, child and adult cancer risks were below EPA's deminimis cancer risk of 1 in 1,000,000 for individual and combined ingestion and dermal exposures.

At a house dust concentration of 1.0 mg/kg, adult and child dermal exposure cancer risks were below a risk of 1 in 1,000,000. Ingestion risks and combined dermal and ingestion risks slightly exceeded a risk of 1 in 1,000,000. Combined dermal and ingestion risks were approximately 2 in 1,000,000 for adults and 3 in 1,000,000 for children.

3. Desired Building Vacuum Dust RBACGs

The ability to quantify PCBs in building dust at 0.25 mg/kg, a typical concentration found in house dust, should insure that risks slightly below 1 in 1,000,000 can be quantified. A quantification limit of 0.035 mg/kg would allow detection of risks in the 1 in 10,000,000 range, assuring that risks in the 1 in 1,000,000 range can be accurately determined. However, given the levels of PCBs that have been documented in house dust, it is quite possible that this lower quantification limit may not be needed. A quantitation limit of 0.25 mg/kg is more than adequate to determine if unacceptable non-cancer hazards exist.

4. Desired Building Wipe Sample RBACGs

In addition to vacuum dust samples, PCB levels in dust and on building surfaces will be determined with wipe samples. The PCB regulations in 40 CFR 761 define a clean-up standard or spill cleanup criteria for PCBs of 10 micrograms per one hundred square centimeters (ug/100cm^2) on wipes collected from indoor surfaces. EPA estimated that inhalation cancer risk from exposure to PCBs at 10 ug/100cm^2 would be at 1 excess cancer case per 1,000,000 exposed (1x10-6) [see ref 4 of DOH]. Similarly, EPA estimated that cancer risk from dermal contact with PCBs at 10 ug/100cm^2 would be at 1 excess cancer case per 100,000 exposed [4]. Therefore, wipe samples will be compared to EPA's clean-up standard or spill cleanup criteria for PCBs of 10 ug/100cm^2. Manchester Environmental Laboratory has a Method Detection Limit of 0.5 ug/wipe, which is more than adequate to determine if unacceptable non-cancer hazards exist.

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References

ATSDR. 2000. Toxicological Profile for Polychlorinated Biphenyls.

Harrad S, Ibarra C, Robson M, Meylmuk L, Zhang X, Diamond M, Douwes J. 2009. Polychlorinated biphenyls in domestic dust from Canada, New Zealand, United Kingdom and United States: Implications for human exposure. Chemosphere. 76:232-238.

U.S. EPA. 1989. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A).

U.S. EPA. 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment.

U.S. EPA. 2010. Integrated Risk Information System, summaries for polychlorinated biphenyls and Aroclor 1254

Washington Department of Health. 2006. Health Consultation, Exposure Investigation Report. Dallas Avenue Neighborhood PCB, Seattle King County, Washington.

Appendix C: Derivation of Building Dust RBACGs

1. Exposure Parameters Used

Table 1: Exposure Parameter Values					
General				Ingestion	Dermal
BW_c	16	IR_c	200	ABSd	0.14
BW_a	70	IR_a	100	SA_c	2800
CF	1.00E-06	FI	1	SA_a	5700
EF	350			AF_c	0.2
ED_c	6			AF_a	0.07
ED_a	30				
AT_car	25550				
AT_non_c	2190				
AT_non_a	10950				
C	0.25 / 1				

Exposure Parameter Definitions

BW_c: Body weight child, kilograms, EPA 1989
BW_a: Body weight adult, kilograms, EPA 1989
CF: Conversion factor, kilograms per milligram
FI: Fraction ingested from the source, unitless:
EF: Exposure frequency, days per year, BPJ
ED_c: Exposure duration, child, years
ED_a: Exposure duration, adult, years
AT_car: Averaging time carcinogen, days
AT_non_c: Averaging time, non-carcinogen, child, days
AT_non_a: Averaging time, non-carcinogen, adult, days
C: Contaminant concentration, mg/kg
IR_c: Ingestion rate, dust, child, mg/day, EPA 1989
IR_a: Ingestion rate, dust, adult, mg/day, EPA 1989
FI: Fraction of dust ingested from the source, unitless, BPJ
ABSd: Fraction of compound absorbed through skin, unitless, EPA 2004
SA_c: Skin surface area, child, cm^2, EPA 2004
SA_a: Skin surface area, adult, cm^2, EPA 2004
AF_c: Soil to skin adherence factor, mg/cm^2, EPA2004
AF_a: Soil to skin adherence factor, mg/cm^2, EPA 2004

2. Equations Used to Assess Hazard/Risk

INGESTION DOSE

$$Dose_{oral} = (C * IR * CF * FI * EF * ED) / (BW * AT)$$

DERMAL DOSE

$DA_{event} = C_{dust} * CF * AF * ABSd$

$Dose_{dermal} = (DA_{event} * EF * ED * EV * SA) / (BW * AT)$

NON CANCER HAZARD QUOTIENT (HQ)

$HQ_{oral} = Dose_{oral} / RfD$

$HQ_{dermal} = Dose_{dermal} / RfD$

$HQ_{total} = HQ_{oral} + HQ_{dermal}$

RfD: Reference dose, mg/kg/day. Value for Aroclor 1254 = 0.00002.

CANCER RISK

$Risk_{oral} = Dose_{oral} * CPF$

$Risk_{dermal} = Dose_{dermal} * CPF$

$Risk_{total} = Risk_{oral} + Risk_{dermal}$

CPF: Cancer potency factor, $(mg/kg/day)^{-1}$. Value used for house dust exposure is 2.

3. Results

Table 2: Dose, Hazard, and Risk Associated with Exposure to Dust Assuming Dust PCB Concentrations of 0.25 and 1 mg/kg.

INGESTION AND DERMAL			**INGESTION**			**DERMAL**		
NON CANCER			**NON CANCER**			**NON CANCER**		
Dose and HQ	Child	Adult	Dose and HQ	Child	Adult	Dose and HQ	Child	Adult
Dose at 0.25 mg/kg	4.2E-06	5.3E-07	Dose at 0.25 mg/kg	3.0E-06	3.4E-07	Dose at 0.25 mg/kg	1.2E-06	1.9E-07
Dose at 1 mg/kg	1.7E-05	2.1E-06	Dose at 1 mg/kg	1.2E-05	1.4E-06	Dose at 1 mg/kg	4.7E-06	7.7E-07
HQ at 0.25 mg/kg	2.1E-01	2.7E-02	HQ at 0.25 mg/kg	1.5E-01	1.7E-02	HQ at 0.25 mg/kg	5.9E-02	9.6E-03
HQ at 1 mg/kg	8.3E-01	1.1E-01	HQ at 1 mg/kg	6.0E-01	6.8E-02	HQ at 1 mg/kg	2.3E-01	3.8E-02
CANCER			**CANCER**			**CANCER**		
Dose and Risk	Child	Adult	Dose and Risk	Child	Adult	Dose and Risk	Child	Adult
Dose at 0.25 mg/kg	3.6E-07	2.3E-07	Dose at 0.25 mg/kg	2.6E-07	1.5E-07	Dose at 0.25 mg/kg	1.0E-07	8.2E-08
Dose at 1 mg/kg	1.4E-06	9.2E-07	Dose at 1 mg/kg	1.0E-06	5.9E-07	Dose at 1 mg/kg	4.0E-07	3.3E-07
Risk at 0.25 mg/kg	7.2E-07	4.6E-07	Risk at 0.25 mg/kg	5.1E-07	2.9E-07	Risk at 0.25 mg/kg	2.0E-07	1.6E-07
Risk at 1 mg/kg	2.9E-06	1.8E-06	Risk at 1 mg/kg	2.1E-06	1.2E-06	Risk at 1 mg/kg	4.0E-07	6.6E-07